LETTERS TO THE EDITOR.

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Asymmetry and Vitalism.

THAT portion of Prof. Karl Pearson's letter in NATURE of Nov. 10 which deals with chemical problems is largely based on misconceptions of the meaning of terms used by chemists. Thus, after quoting a statement of mine regarding optically active compounds, he says: "An optically active compound means merely a preponderance of one kind of enantiomorph." That is precisely what it does *not* mean; that would be an optically active *mixture*. No chemist ever uses the word 'compound" when he means "mixture"; I meant one kind of enantiomorph and one only. Moreover, I explained this point in detail in my first reply. Prof. Percy Frankland, as a chemist, has of course found no difficulty in following my meaning; he says that the question which I raised was: "the possibility of producing, without the interference of a living agency, an optically active substance *unaccompanied by its enantiomorph*." A great part of Prof. Pearson's letter is therefore devoted to combating an opinion which I never expressed, and I am consequently relieved from the necessity of further discussing this part, or of calling attention to similar misconceptions which it contains. One point, however, I must notice. Prof. Pearson complains that I have supposed that he meant "twenty" molecules and no more, when in reality he referred to twenty tosses of a coin; and he adds that he was willing to assume the formation of a million molecules. I was led to take his words in the former sense by my impression—as it now appears, a mistaken impression—that he really understood that I was arguing about *single* asymmetric compounds; and I imagined that he purposely assumed the formation of only a small number of molecules in order that they might conceivably be all of one kind of asymmetry.

The part of the letter which I wish especially to consider is that in which Prof. Pearson suggests a hypothetical symmetric mechanism by which he believes a separation of enantiomorphs might be effected. This suggestion, if valid, strikes at the root of a generally accepted principle of molecular asymmetry. I can sincerely say that it is with the utmost diffidence that I venture to call in question any result that Prof. Pearson has arrived at by a mathematical process. But in the present case, I have tried in vain to follow his reasoning; whilst, if I work out the problem in my own way, I arrive at a conclusion exactly the opposite of his. I have no choice, therefore, but to state my results, and to ask Prof. Pearson to correct me if I am wrong.

The tetrahedral representation of two enantiomorphous molecules, each containing a single asymmetric carbon atom, is given in my address (NATURE, vol. lviii. p. 455). The tetrahedra (Figs. 1 and 2) are assumed to be irregular; the four different atoms or groups are situated at different distances from the central carbon atom to which they are attached; the two tetrahedra are enantiomorphous. It must be carefully borne in mind that in these two structures *all corresponding molecular dimensions are identical;* the two structures differ only in their opposite asymmetry.

Prof. Pearson imagines a thin cylindrical sheet of optically inactive mixture to be whirled round the axis of the sheet; and he argues that owing to the position of the centroid in these enantiomorphous tetrahedra, the one kind might be in *stable* equilibrium when, say, their X' angle sets inwards, and the other, when this sets outwards; "or at least some similar like difference of positions will differentiate like from unlike enantiomorphs." Then, on allowing a strip of the cylindrical surface placed horizontally to fall through a viscous fluid, the difference of resistance caused by this difference of position may effect a separation of the two kinds.

As I have said, I am unable to follow this reasoning. I should discuss the problem as follows:

Let H, X', Y', Z' (Figs. 1 and 2, *loc. cit.*) represent the four different atoms or groups attached to the central carbon atom; and, as regards their masses, let $H<X'$, $X'<Y'$, and $Y'<Z'$.

Then, supposing a thin cylindrical sheet of substance consisting of equal numbers of the two enantiomorphous tetrahedral forms to be whirled about its axis, each tetrahedron, whether right-handed or left-handed, will be in stable equilibrium when the distances of the foregoing groups from the axis of rotation of the sheet are in the order H, X', Y', Z'. Therefore the edge $Y'Z'$ of either tetrahedron will be nearer to the outer surface of the sheet than the edge HX'; and each of these edges will be inclined towards this outer surface so that the ends Z' and X', of these edges, are respectively nearer to it than the ends Y' and H; and the inclination of corresponding edges will be the same in both tetrahedra. A line joining the centroid of the face $HX'Y'$ with Z', and produced through Z' to meet the outer surface of the sheet, will form the same angle with this surface, whether the tetrahedron be right-handed or left-handed. Right-handed and left-handed molecules will therefore be affected in exactly the same manner when a strip of the cylindrical surface is placed horizontally and allowed to fall through a viscous fluid; and no separation of the two kinds will occur. The "difference of positions" which Prof. Pearson demands, does not extend beyond the fact that a continuous curve passing towards the surface of the sheet through the groups H, X', Y', Z' in succession, will in the one set of tetrahedra describe a right-handed, in the other a left-handed helix.

I am unable to arrive at any other conclusion than the foregoing.

Prof. Percy Frankland's suggestion of a mechanism by which, starting with a single asymmetric molecule, an optically active compound might be produced unaccompanied by its enantiomorph, practically coincides with that published a little later by Mr. Strong. Such an action is, as I admitted in noticing Mr. Strong's communication, certainly conceivable, although, as an actual process occurring under chance conditions, it is exceedingly improbable. I regret that I overlooked the possibility of such an action.

Prof. Frankland's other suggestion is that, prior to the existence of life on the earth, "the asymmetry of solar radiation may originally have determined the exclusive synthesis of one enantiomorph." I had already considered this possibility. It seems to me that the earth's rotation, to which this asymmetry of solar radiation is due, is so slow as compared with the atomic and molecular motions involved in the production of chemical compounds, that it is difficult to understand how it could perceptibly impress its asymmetry on chemical action.

Although, in view of the arguments adduced by Prof. Percy Frankland and Mr. Strong, I no longer venture to speak of the *inconceivability* of any mechanical explanation of the production of *single optically active compounds asymmetric always in the same sense*, I am as convinced as ever of the *enormous improbability* of any such production under chance conditions. The processes suggested by Prof. Frankland and Mr. Strong are purely hypothetical and are likely to remain so.

The University, Aberdeen, November 17. F. R. JAPP.

Early History of the Great Red Spot on Jupiter.

HAVING collected a number of observations and drawings of objects bearing a suggestive resemblance to this feature, and made during the period from September 5, 1831, to November 14, 1869, I have been enabled to determine the rotation period during that time. This, taken in combination with my discussion of the observations from November 14, 1869, to July 30, 1898 (NATURE, August 4, 1898, and *Monthly Notices* R.A.S., vol. lviii. No. 9), extends the whole interval over which the spot can be pretty certainly identified to nearly 67 years, or 24,435 days, during which the mean rate of rotation was

9h. 55m. 36·2s.

and the total number of rotations

59,071.

My investigation, though quite satisfactory so far as it goes, would be rendered more certain if further observations or drawings could be secured for the period prior to 1869. I should be much obliged, therefore, if any of your readers having such materials in their possession would supply copies, or allow me to have temporary use of the originals. The red spot has varied its appearance so much that it may either appear as a red oval mark, as an elliptic ring, or be practically invisible as at present, though its place may be clearly indicated by a marked hollow in the southern side of the south equatorial belt. Old

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drawings of this hollow in the belt will be almost as important, therefore, as delineations of the ellipse itself.

Additional records of this character will serve to exhibit the precise epochs when decided changes occurred in the rate of motion of the spot or its surroundings. The mean rotation period, as mentioned above, seems very well assured from the materials already collected; but it is most desirable to gain more exact information as to the variations, so that the length of the cycle suggested by the observations may be definitely found.

102 City Road, Bristol, W. F. DENNING.
November 25.

Galvanometers and Magnetic Dip.

WHILE the variation of magnetic dip in Europe (from about 71° in Aberdeen to 58° in Rome) probably gives little, if any, trouble to users of compasses and portable horizontal galvanometers with pivoted needles, the dip of about 58° *to the south* at the Cape is sufficient to disturb seriously such instruments.

I have seen several galvanometers which were useless until readjusted; these, having been sent out by makers of high reputation, were thought to have received damage on the voyage. I learn that it is a matter of routine in the Post Office to correct all new instruments for dip.

Small pocket compasses are not appreciably affected, because the centre of gravity of the needle is generally well below the point of support, and prismatic compasses escape, probably, on account of the weight of the card.

Instrument makers could easily arrange a small magnetic field in their testing rooms, with a dip to the south of about 60°, in which to adjust instruments intended for the Cape or Australia. A. P. TROTTER.

Cape Town, November 9.

Atropa Belladonna and Birds.

FOR eight years I have had a large plant of Atropa growing here in my garden amongst currants and gooseberries; close by it is a mountain-ash, and at a short distance a large cherry-tree. Birds, including the blackbird, build in the garden; but although the cherries, currants, gooseberries and raspberries are annually stripped, the Belladonna berries are never touched. The birds are encouraged, and the fruit can be spared.

The Belladonna berries are conspicuous objects from July to November; there are hundreds on my plant every year, long after other fruits have vanished—black, lustrous, luscious-looking—but no bird ever touches them. W. G. S.

Dunstable.

THE ADVANCEMENT OF SCIENCE IN THE ANTARCTIC.

THE President of the Royal Geographical Society has issued an urgent appeal to the Fellows for funds to carry out a National Scientific Expedition to the Antarctic regions on a scale worthy of the traditions of the British nation. He states that a joint committee of the Royal Society and of the Royal Geographical Society has been formed for the purpose of obtaining funds for this purpose, but that "the responsibility of maintaining the credit of the nation in this respect devolves upon the Royal Geographical Society more than on any other body." The Council has accordingly set aside 5000*l*. out of the funds of the Society as a nucleus, to which Mr. Harmsworth, one of the Fellows, has generously added a like sum, and we understand that smaller contributions are rapidly coming in. The cost of a completely equipped expedition will be great, too great we fear for a single Society, even so large and so rapidly growing as the Geographical, to provide, for it is estimated at 100,000*l*. Yet from the point of view of the scientific results sure to be obtained, and the number of the scientific public, the sum is by no means unduly large. Doubtless there will be other Fellows of the Society who can afford and who will not shrink from sharing the position of pre-eminent generosity now occupied by one of their number; but the majority of those interested in the scientific aspects of geography are not wealthy, and they will require assistance from other friends of science. While the vastness of the blank space on the map within the Antarctic circle is sufficient to account for the almost personal feeling of responsibility which Sir Clements Markham and his colleagues acknowledge, there are great gaps in all the natural sciences which only Antarctic research can fill. The physicist, as Prof. Rücker has recently stated, is in the anomalous position of having a theory of terrestrial magnetism far in advance of the facts on which it is based. The meteorologist has two views of atmospheric circulation to consider which can only be reconciled or resolved by observations in the far south. There are geological questions of an interesting kind awaiting solution, including the immensely interesting problem of the former attachment of the southern continents to the land that lies under the south-polar ice-cap. In chemistry uncertainties exist as to the interactions between sea-water and atmospheric gases on the one hand, and marine deposits on the other, which can be studied more fully in the Antarctic than elsewhere. Biology, apart from the certain accumulation of many new species of marine organisms, which might prove a burdensome boon, will find some fascinating problems of environment. The question of the bipolar occurrence of identical species is not as yet overburdened with data for its discussion; but greater interest centres in the life conditions of the vast icy continent—certainly 4,000,000 square miles in area—and absolutely isolated from all the rest of the land of the globe. The climate of most of this land cannot be more rigorous than that of parts of the north polar regions where land-mammals exist; and the biologist, with the exceptional fauna of Australia in view, may reasonably desire to know if there is animal life on Antarctica, and if so what forms it assumes in the unique environment of isolation and low temperature. Even the astronomer may look forward to some return for his contributions to an Antarctic expedition, for where on the land-surface of the globe is there so fine and large a field for the reception and preservation of meteorites? The anthropologist alone can afford, it would appear, to receive the appeal impassively.

All the great scientific societies have long ago expressed their opinion that the time is ripe for a renewal of Antarctic research. The whole newspaper press of the country has applauded the proposal to give effect to this opinion: almost the whole, we ought to say, for a cynically selfish opposition has been offered by one or two of the less influential papers representing the "little Englanders" in science. We hope that all scientific men who have given their approval to the proposed expedition—and who has not?—will ratify that approval, and assist in enabling this country to co-operate with Germany in 1900, and make the last year of the greatest century of scientific advance the world has known the most memorable of all in a field of science whence a great harvest of new facts, but no material return, is to be expected.

Promises and subscriptions are invited to be sent to the credit of the National Antarctic Expedition, to Messrs. Cocks, Biddulph, and Co., Charing Cross, S.W., or to the Royal Geographical Society, 1 Savile Row, W.

THE IMPERIAL UNIVERSITY OF LONDON.

IT is a matter little creditable to English culture that it has required some twenty years of agitation to bring a University for the most important city of the world into the region of practical politics. Within the last fortnight, however, we are glad to know that the machinery of the new Commission has been put in motion, and that inquiries are being made and questions being inquired into of the highest order of importance.

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